

WE CLAIM:

*Sub B1*

1. A vaccine against an infectious disease caused by an infectious agent comprising a carrier strain having a membrane vesicle of a microorganism integrated into the cell surface of the carrier strain, wherein the membrane vesicle has an amount of an antigen associated with its surface which is effective to provide protection against the infectious agent.

2. A vaccine as claimed in claim 1 wherein the infectious agent is a microorganism which produces membrane vesicles.

3. A vaccine as claimed in claim 2 wherein the microorganism is *Pseudomonas aeruginosa*, *Escherichia coli*, *Salmonella gastroenteritis* (*typhimurium*), *S. typhi*, *S. enteriditis*, *Shigella flexneri*, *S. sonnei*, *S. dysenteriae*, *Neisseria gonorrhoeae*, *N. meningitidis*, *Haemophilus influenzae*, *H. pleuropneumoniae*, *Pasteurella haemolytica*, *P. multilocida*, *Legionella pneumophila*, *Treponema pallidum*, *T. denticola*, *T. orale*, *Borrelia burgdorferi*, *Borrelia* spp., *Leptospira interrogans*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *P. morganii*, *P. mirabilis*, *Rickettsia prowazekii*, *R. typhi*, *R. rickettsii*, *Porphyromonas (Bacteroides) gingivalis*, *Chlamydia psittaci*, *C. pneumoniae*, *C. trachomatis*, *Campylobacter jejuni*, *C. intermedius*, *C. fetus*, *Helicobacter pylori*, *Francisella tularensis*, *Vibrio cholerae*, *Vibrio parahaemolyticus*, *Bordetella pertussis*, *Burkholderia pseudomallei*, *Brucella abortus*, *B. suis*, *B. melitensis*, *B. canis*, *Spirillum minus*, *Pseudomonas mallei*, *Aeromonas hydrophila*, *A. salmonicida*, and *Yersinia pestis*.

*Sub A1*

4. A vaccine as claimed in claim 2, wherein the membrane vesicle is a natural membrane vesicle of the microorganism containing outer membrane and periplasm components.

*Sub A2*

5. A vaccine as claimed in claim 2 wherein the membrane vesicle is a large membrane vesicle which is obtained by treating the

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microorganism with a surface-active agent, and is characterized by containing outer membrane, cytoplasmic membrane or plasma membrane, and cytoplasm components.

6. A vaccine as claimed in claim 1 which is effective against another infectious agent comprising a second carrier strain having a membrane vesicle of a microorganism integrated into the cell surface of the second carrier strain, wherein the membrane vesicle has an amount of an antigen associated with its surface which is effective to provide protection against the other infectious agent.
7. A pharmaceutical composition comprising a membrane vesicle of a microorganism containing one or more enzymes with peptidoglycan hydrolase, lipase and proteolytic activity in an amount effective to have a bactericidal effect on gram-negative and/or gram-positive bacterial pathogens, and a pharmaceutically acceptable vehicle or diluent.
8. A pharmaceutical composition as claimed in claim 7 which additionally contains a therapeutic agent.
9. A pharmaceutical composition as claimed in claim 8 wherein the therapeutic agent is an antimicrobial agent or an antiviral agent.
10. A pharmaceutical composition as claimed in claim 9 wherein the therapeutic agent is an aminoglycoside.
11. A pharmaceutical composition as claimed in claim 7 additionally comprising membrane vesicles of another microorganism containing one or more enzymes with peptidoglycan hydrolase, lipase and proteolytic activity in amounts effective to have a bactericidal effect on gram-negative and/or gram-positive bacterial pathogens.

12. A method of treating an infectious disease caused by a gram-negative and/or gram-positive bacterial pathogen comprising administering an amount of a pharmaceutical composition as claimed in claim 7 effective to have a bactericidal effect on the gram-negative and/or gram-positive bacterial pathogen.
13. A drug delivery system comprising a membrane vesicle of a microorganism containing a therapeutic agent in an amount effective to introduce the therapeutic agent into a host.
14. A drug delivery system as claimed in claim 13 wherein the therapeutic agent is an antimicrobial agent or an antiviral agent.
15. A method of inserting a nucleic acid molecule into a target cell which comprises encapsulating the nucleic acid in a membrane vesicle of a microorganism, and bringing the membrane vesicle in contact with the target cell whereby the nucleic acid molecule is inserted into the cell.
16. A method as claimed in claim 15, wherein the nucleic acid molecule encodes a protein which is endogenous or exogenous to the microorganism.
17. A method as claimed in claim 15 wherein the nucleic acid molecule encodes a mammalian protein, viral protein, fungal protein or protozoal protein.

*add*  
*B3*